

REMARKS/ARGUMENTS

In the specification, the paragraph beginning at page 3 has been amended to correctly indicate that shot peening is not acceptable for deep compressive stress penetration. The paragraphs beginning at pages 11 and 15 have been amended to correct topographical errors. The paragraph beginning at page 12 has been amended to further define the AMS 2340 standard and the use of Almen strips. The new paragraph added after the first paragraph on page 3 discusses the problems that occur in gas turbines when inlet fogging or water injection is employed.

Claims 1-4 and 6-8 remain in this application.

Claim 5 has been canceled.

Claims 1 and 4 have been amended to define the residual compressive stress without reference to a standard which may vary, "the proportional limit of the material." Further, the coating material has been claimed as a member of Markush group and the thickness of the layers has been clarified to refer to the thickness of all the layers together.

Claims 2 and 7 have been amended to claim only the alloying elements.

Claims 3 and 8 have been amended to claim the method of cold working as a member of a Markush group.

Claim 6 has been amended to remove the confusing ceramic bead peening size and method.

Claims 9 and 10 have been added to claim the method of inspecting the finished blade, vane or component.

In response to the Office Action of March 11, 2005, Applicant requests re-examination and reconsideration of this application for patent pursuant to 35 U.S.C. 132.

Rejections under 35 USC 112

Claims 1-8 stand rejected under 35 U.S.C. 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1-4 and 6-8 have been extensively amended to overcome all the problems noted by the Examiner under 35 U.S.C. 112.

In view of the above noted amendments, Applicant respectfully requests that the rejections of claims 1-4 and 6-8 under 35 U.S.C. 112 now be withdrawn.

Rejection under 35 USC 103(a)

Claims 1-8, as originally presented, stand rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta et al. (US 4,904,528) in view of Cretella et al. (US 4,028,787), Bergmann et al. (US 5,238,546) and Paidassi et al. (US 5,702,829). The Examiner alleges that Gupta et al. teach all the features of the claims

except (1) the cleaning step ii, (2) the temperature of deposition, (3) the layers of different hardness, (4) the repair and all repairing steps (claim 4), (5) the inspection steps (claim 5) and (6) the peening step (claim 6).

The Examiner further alleges that Cretella et al. teach the recovery and repair of used gas turbine engine blades by first cleaning and degreasing them. They are then inspected by fluorescent penetrants. Cracks and other defects are repaired by welding and building up. The surface of the blade is cleaned and a shot peening operation can occur. The blade is then coated and finally inspected.

The Examiner also alleges that Bergmann teaches a process for the cathodic arc deposition of TiN. The Bergmann process occurs at a temperature which does not exceed 222 degrees Celsius.

Finally the Examiner contends that Paidassi et al. teach providing a protective coating on a component of a gas turbine blade. The coating comprises layers each having a different hardness. The layers can be applied by a cathodic deposition and the total thickness of the layers can be 5-200 microns.

The Examiner concludes that it would have been obvious to modify Gupta et al. to repair turbine blades and to perform cleaning between the shot peening and the coating as taught by Cretella et al. in order to provide a desirable coated blade product, because Gupta et al. teach a desirable protective coating

TiN to be applied to turbine blades and Cretella et al. teach that it is desirable to repair and reuse turbine blades and to clean blades before coating treatments. Further it would have been obvious to modify Gupta et al. in view of Cretella et al. to optimize the temperature of the deposition of the coating by routine experimentation, because Bergmann teaches that when using cathodic deposition the deposit TiN, it is known to use a temperature no higher than 222 degrees Celsius. Also it would have been obvious to modify Gupta et al. in view of Cretella et al. and Bergmann et al. to provide the coating made up of layers of TiN of different hardness as suggested by Paidassi et al. to provide a component protected under various conditions, because Gupta et al. in view of Cretella et al. and Bergmann et al. teach to protecting a turbine component with TiN and Paidassi et al. teach that when protecting a turbine component, providing different layers of different hardness provides for optimum protection of the component. The Examiner also concludes that it would have been obvious to modify Gupta et al. in view of Cretella et al., Bergmann et al., and Paidassi to use the inspection step of claim 5 and the peening of claim 6 with an expectation of having desirable inspection and peening, because Cretella et al. teach the desire to inspect turbine blades to be repaired using a fluorescent inspection and one of ordinary skill in the art would use a well known method of testing as provided by the ASTM method of claim 5

in order to provide controlled testing and further because Gupta et al. teach the desire to shot peen to provide a controlled range of residual stress and one of ordinary skill in the art would use a well known method of peening as provided by the AMS method of claim 6 in order to provide controlled achievement of residual stress.

In order to establish a *prima facie* case of obviousness, three basic criteria must be met (MPEP 2141). First, there must be some suggestion or motivation, either in the references themselves or in the knowledge available to one of ordinary skill in the art , to modify the references. Second, there must be a reasonable expectation of success. Finally, the prior art references (when combined) must teach or suggest all of the limitations of the claims.

None of the cited prior references teach or suggest all of the limitations of the claims as now presented, specifically, cold working the blade or component to impart a residual compressive stress which approximates the proportional limit of the material of the blade or component. Gupta et al. teach imparting a residual compressive stress of 50 to 100 ksi which is not the proportional limit of the material of the blade or component. In addition, Gupta et al. recognize that their process is useless in gas turbine engine applications and in fact would be detrimental (col. 5, lines 58-65). Thus, not only does Gupta et al. not teach or disclose the claimed limitations, but also their process would not provide a

reasonable expectation of success.

The process of blade repair disclosed by Cretella et al. does not involve the introduction of residual compressive stresses into the blade. Rather, after cleaning the surface by shot peening Cretella et al. plasma spray the surface with a metal alloy powder and then sinter the blade in a furnace at 2,000°F. The blade must then be refinished and polished prior to its use. The high sintering temperature would remove any residual compressive stresses introduced into the blade by the process of Gupta et al. Therefore, if Gupta et al. were modified by Cretella et al., as suggested by the Examiner, the beneficial effects of the Gupta et al. treatment would be negated and hence there would not be a reasonable expectation of success by combining the teachings of Gupta et al. and Cretella et al.

In light of the all of the above remarks, Applicant respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness and further contend that a person of ordinary skill in the art, having the references Gupta et al., Cretella et al., Bergmann et al., and Paidassi et al. in front of him/her would not have the information and motivation necessary to arrive at Applicant's invention.

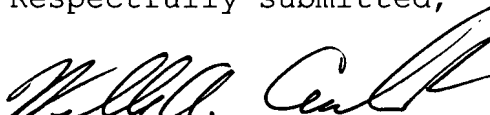
Accordingly, Applicant respectfully submits that the claimed processes distinguish over the prior art and respectfully request that the rejection of claims 1-4 and 6-8 under 35 U.S.C. 103(a) now

be withdrawn. It is also respectfully requested that claims 1-4 and 6-10 be passed to issue.

SUMMARY

In light of the foregoing remarks and amendment to the claims, it is respectfully submitted that the Examiner will now find the claims of the application allowable. Favorable reconsideration of the application is courteously requested.

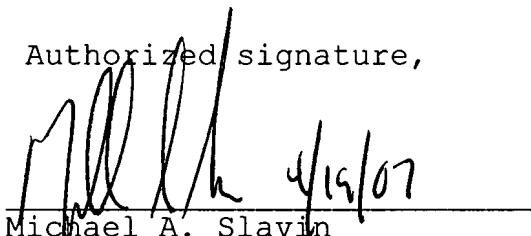
Respectfully submitted,



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